Pattern Recognition Techniques and Financial Analysis

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“He is the source of light in all luminous objects. He is beyond the darkness of matter and is unmanifested. He is knowledge, He is the object of knowledge, and He is the goal of knowledge. He is situated in everyone’s heart”

-Bhagavad-Gita As It Is (13.18)

I dedicate this thesis to my parents,

for teaching me the value of knowledge and my wife,

for supporting me to acquire that knowledge.

ABSTRACT

The balance sheet statement is an essential feature of financial reporting, and is expected to convey complete information on firms' operating business decisions. Since these decisions are based on the manager's perception of the existing and future investment opportunities, they cannot be directly observed. This results in two major data analysis issues. First, it is difficult to observe directly the most common operating business decisions; secondly, these decisions may not have a same linear relation to all firms and all firm's performance measures. This thesis attempts to address these issues in three interconnected essays.

The first essay examines an outcome of the double-entry bookkeeping system when financial transactions simultaneously shift a firm's financial position, providing the special information to interpret the meaning of a transaction. Using the factor analysis model, this essay makes use of this information, and identifies the five fundamental factors (decisions) that can capture a firm's time-varying operating business status in a given year. These factors include: financial flexibility, short-term credit, long-term investment, convertible debt usage, and preferred stock usage. The method of extracting these factors controls for missing variable bias, account for limited attention, and provide true decomposition of accounting aggregates such as total asset growth. These factors subsist in predicting future stock returns, forecasting a firm's value (Tobin's Q), cash flows, and earnings beyond their well-known determinants.

The second essay explores the sources of return predictability contained in financial flexibility, which is the first factor identified in essay one. The horse races of the asset pricing versus mispricing tests find a significant positive premium on financial flexibility based return factor, and make it a candidate for a new priced factor. The evidence suggests that covariances dominate the characteristics, and it is non-redundant to well-established risk factors. This factor meets the new conservative minimum of *t*-statistics value of above 3.0 and is constructed using unobserved information.

The final essay addresses the second issue in the data analysis by employing the nonlinear firm grouping technique – the K-means clustering analysis method. Firms are grouped in their 12 natural groups using the five fundamental factors identified in the first essay, and firm size as the clustering criteria. This essay shows how firms differ on priority and the composition of their common operating decisions. This type of firm grouping suggests that operating business decisions are related to firm-specific health and structure instead of industry. This essay recommends the nonlinear firm grouping prior to employing the linear regression models in predicting future performance measures to improve the precision of business analysis.

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